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Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

In the Matter of )  
 )  
Federal-State Joint Board on )  
Universal Service: )  
Promoting Deployment and )  
Subscribership in Unserved )  
And Underserved Areas, Including )  
Tribal and Insular Areas )

CC Docket No. 96-45

**COMMENTS OF QUALCOMM INCORPORATED**

QUALCOMM Incorporated ("QUALCOMM"), by counsel and pursuant to Section 1.415 of the Commission's rules, hereby submits its comments in the above-captioned proceeding. As a pioneer of Code Division Multiple Access (CDMA) technology and other advanced communications systems, QUALCOMM knows that wireless telecommunications is revolutionizing society. Wireless services, particularly QUALCOMM's new wireless Internet technology, HDR (for High Data Rate), also have the potential to bring revolutionary economic opportunities to unserved and underserved communities. As we explain in greater detail below, HDR has the capacity to deliver very high speed data services – up to 2.4 Mbps – in both urban and rural environments, and can fill the critical lack of broadband access on Tribal Lands in particular.<sup>1</sup>

In the Notice of Proposed Rulemaking ("NPRM") in this proceeding, the Commission seeks comment on ways in which it can promote expansion in the level of basic and advanced services in unserved and underserved areas, including Tribal Lands

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<sup>1</sup> Attached hereto as Attachment 1 is a copy of a presentation made by Kimberly Kleber, Director of Product Marketing for Qualcomm, entitled "HDR: The Internet Unleashed," as part of the Office of Engineering & Technology's November 30, 1999, Tutorial, "Wireless Access to the Internet." An audio recording of Ms. Kleber's presentation is available from OET's website at <<http://www.fcc.gov/oet/tutorial/tutorial.html>>

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and insular areas, through enhancements to its Universal Service program and other means.

QUALCOMM urges the Commission to adapt its Universal Service programs and other policies in order to suit the telecommunications market of the 21<sup>st</sup> Century. Policies that for decades were intended to foster expansion of the wired telephone network may be inadequate to serve the needs of consumers today, especially residents of unserved or underserved areas such as Tribal Lands. As the Commission has recognized in its companion proceeding on extending wireless telecommunications services to Tribal Lands, *wireless* networks may be the best means of providing service to these unserved areas.<sup>2</sup>

Therefore, the Commission's policies today must encourage the most flexible and innovative responses on the part of service providers, local authorities and consumers. These policies should specifically contemplate that basic and advanced wireless services may receive universal service funding when this is necessary to provide service to consumers in unserved or underserved areas.

**I. Traditional Wireline Networks Have Failed To Provide Services To Tribal Lands**

As the Commission is aware, Tribal Lands, even more than other remote rural locations, suffer from a lack of basic, much less advanced, telecommunications services. Recent statistics show that the average telephone penetration rate on Tribal Lands is 53%

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<sup>2</sup> *Notice of Proposed Rulemaking, In the Matter of Extending Wireless Telecommunications Services to Tribal Lands*, WT Docket No. 99-266, FCC 99-205 (rel. August 18, 1999).

as compared to a national average of 94%.<sup>3</sup> In some cases, the figures are far worse. For instance, the penetration rate for the San Carlos, Arizona reservation is a mere 16.1%.<sup>4</sup> The rate for the Navaho Reservation and Trust Lands in the Four Corners region is 18.4%.<sup>5</sup> The National Telephone Cooperative Association (NTCA) reports that the penetration rate on the Mescalero Apache Reservation is just 13%.<sup>6</sup>

Of course, this very low level of telephone penetration translates to an even lower rate of penetration for advanced services. This is true both for economic and for technical reasons. The Clinton Administration has recognized that the lack of advanced telecommunications services in poor and remote areas of the Nation will severely limit economic opportunities and access to essential services for residents of these areas in the 21<sup>st</sup> Century and is now actively seeking to improve this situation. Recently, on the occasion of the Commerce Department's Digital Divide Summit, the President stated, "[t]ogether we have the power to determine exactly what we want the Internet to become... to be an instrument of empowerment, education, enlightenment, economic advance and community-building all across America, regardless of the race, the income, the geography of our citizens."<sup>7</sup>

One reason Tribal Lands lack basic and advanced telecommunications services is that reservations are in remote, "high cost" areas. Because most Tribal Lands are located far from major population centers, wireline telephone companies typically would have to

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<sup>3</sup> See *Assessment of Technology Infrastructure in Native Communities, Final Report, July 1999*, College of Engineering, New Mexico State University, Research sponsored by the Economic Development Administration, U.S. Department of Commerce ("EDA Report") at 16-17.

<sup>4</sup> *Id.*

<sup>5</sup> *Id.*

<sup>6</sup> NTCA Report, "Dial-Tone Is Not Enough: Serving Tribal Lands," November, 1999. This report is available on the Internet at <[http://www.ntca.org/leg\\_reg/tribal/TRI1299.pdf](http://www.ntca.org/leg_reg/tribal/TRI1299.pdf)>

<sup>7</sup> See Remarks by the President on Bridging the Digital Divide, December 9, 1999. <<http://www.whitehouse.gov/WH/News/html/19991209.html>>

spend an enormous amount of money in order to extend lines to reach them.<sup>8</sup> Where such service actually exists, this expense most often is reflected in the price that residents must pay to obtain such service.<sup>9</sup> Moreover, because Indians living on Tribal Lands typically are among the poorest Americans, the cost of such service, where it does exist, may be beyond the means of most residents.<sup>10</sup>

At the same time, even where basic service exists, wired infrastructure is unlikely to be able to provide advanced services. Wireline service to Tribal Lands generally is supplied over twisted copper wire. High capacity service over copper, Digital Subscriber Line (DSL) can only be provided to customers located within approximately 18,000 feet of the nearest local switch.<sup>11</sup> Subscribers on Tribal Lands are typically much farther than 18,000 feet from a central office. The cost of upgrading wired infrastructure to provide advanced services to Tribal Lands would be absolutely prohibitive, since it would probably require deployment of fiber optic cable over vast, sparsely populated areas.

The result of these factors is that the traditional, wired telephone network has failed to provide even basic, much less advanced, telecommunications services to many residents of Tribal Lands. These Americans have, quite literally, fallen through the Net.

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<sup>8</sup> The Commission notes as an example the high extension charge estimates issued by the Navajo Communications Company in 1997. NPRM at ¶24.

<sup>9</sup> The EDA Report found that the average reservation household telephone installation cost was \$78. The typical household monthly service costs were \$100 for telephone basic service and \$126 for long distance service within the community. EDA Report at 18.

<sup>10</sup> For instance, in the Navajo Reservation, where individuals earn an average income of just \$6,352 per year, 35% of new telephone connections are eventually disconnected. EDA Report at 30.

<sup>11</sup> *Report, Inquiry Concerning Development of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146, FCC 99-5 (February 2, 1999) at Appendix A, 2.

## **II. Wireless Technology – Including HDR – Is the Solution to the Problems of Providing Service to Tribal Lands**

### **A. Basic Wireless Telecommunications**

The Universal Service Fund was designed to compensate eligible telecommunications carriers in part for the cost of bringing telecommunications services to remote, high cost areas like Tribal Lands. In the instant NPRM, the Commission seeks comment on ways to improve the way the current system promotes the deployment of wireline services.

While QUALCOMM applauds the Commission's goal of promoting service to Tribal Lands, QUALCOMM believes that encouraging extension of the existing wired infrastructure to Tribal Lands is not the solution. The wired infrastructure, even where it exists, is of very poor quality and is not likely to be substantially improved, even with increased Universal Service support. Thus, QUALCOMM urges the Commission to promote what QUALCOMM believes to be a much more promising means of serving Tribal Lands, namely *wireless* service.

The most obvious benefit of wireless service is its significantly reduced infrastructure costs. Rather than burying or stringing miles of telephone lines, wireless service providers can establish areas of operation with a series of stand-alone transmission points many miles away from the nearest wireline switch.<sup>12</sup> Further, and of equal benefit, end users of wireless services need not be physically connected to the system through "last mile" wires into their homes. The result of these efficiencies is a

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<sup>12</sup> This also can be a benefit in establishing service over rugged terrain.

service that can be much more affordable to residents of Tribal Lands and other remote locations.<sup>13</sup> Of course, a further benefit of wireless service is that it can be used either as a fixed or a mobile service. This advantage can be especially important in sparsely populated areas of the country where the nearest residence or business may be many miles away.

There are already wireless carriers that have recognized that they are the best hope for access by residents of Tribal Lands. For instance, Western Wireless is actively working with over 50 reservations in 17 Western States, including the Navajo Nation, to bring cellular, paging, CLEC and long distance service to their residents. Western Wireless has pending before the Commission several requests for designation as an eligible telecommunications carrier for universal service purposes as well.<sup>14</sup> Similarly, Centennial Cellular Corporation has brought affordable fixed wireless service to Puerto Rico, which, as an island, shares many of the same geographical problems with remote rural locations.<sup>15</sup> Indeed, even the NTCA reluctantly admits that in some cases wireless service can be a superior alternative to traditional wireline for the provision of basic voice services.<sup>16</sup>

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<sup>13</sup> In the Wireless NPRM, the Commission notes data submitted by Western Wireless indicating that the forward looking cost of cellular service is less than comparable costs for wireline technology for a number of wire centers, including several located in North Dakota and Montana. Wireless NPRM at ¶8.

<sup>14</sup> See Western Wireless Corporation Petitions for Designation as an Eligible Telecommunications Carrier to Provide Services Eligible for Universal Service Support in Wyoming, CC Docket No. 96-45, Public Notice DA 99-2511 (November 12, 1999); Western Wireless Corporation Petition for Designation as an Eligible Telecommunications Carrier and for Related Waivers to Provide Services Eligible for Universal Service Support to Crow Reservation, Montana, CC Docket No. 96-45, Public Notice DA 99-1847 (September 10, 1999).

<sup>15</sup> Wireless NPRM at ¶10.

<sup>16</sup> NTCA "Dial-Tone Is Not Enough: Serving Tribal Lands," November, 1999, at 38.

## **B. Advanced Services**

In Section 254 of the Telecommunications Act, Congress expanded the definition of universal service to include the goal of deployment of advanced telecommunications services to all Americans, including residents of Tribal Lands and other remote areas.<sup>17</sup> As noted above, traditional wired infrastructure is technically incapable of providing advanced services to Tribal Lands. The cost of upgrading wired infrastructure to provide advanced services on Tribal Lands would be prohibitive, since it would probably require deployment of fiber optic cable over vast, sparsely populated areas. At the same time, even where wireless service is being provided, such service still is very slow and cannot support broadband applications.<sup>18</sup>

QUALCOMM's new HDR technology can solve these problems. QUALCOMM has optimized HDR technology for the delivery of wireless data.<sup>19</sup> As a result, HDR can deliver data at speeds up to 2.4 Mbps, which is significantly faster even than T1 access provided to business customers in urban areas over landline networks. With HDR technology, wireless carriers could provide high-speed Internet access, including high quality streaming video, to fixed and mobile subscribers, including, of course, subscribers on Tribal Lands.

QUALCOMM's HDR technology has a number of advantages over other technologies – wired or wireless. First, it uses a single 1.25 MHz channel for 2.4 Mbps forward rate, which makes it the most spectrally efficient technology available that can achieve such high data rates. QUALCOMM has demonstrated HDR in the PCS band, but

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<sup>17</sup> 47 USC§254(b)(2).

<sup>18</sup> NCTA at 38-40.

<sup>19</sup> HDR has been designed to provide services using the Internet protocol ("IP"). As a result, while HDR is a data service, it can also carry voice over IP.

it could also be deployed in the cellular bands or in other bands. HDR can be most easily deployed by existing CDMA carriers because the 1.25 MHz HDR channel fits easily into a standard CDMA channel plan. Carriers using other technologies for voice services, such as TDMA or GSM or even AMPS, however, also could deploy HDR provided they can set aside 1.25 MHz of spectrum in cells in which they intend to offer wireless broadband services. Although many carriers in urban areas are facing capacity constraints, on sparsely populated Tribal Lands it should be possible for any cellular or PCS carrier to dedicate one 1.25 MHz channel to HDR in order to provide broadband access.

Further, HDR can be priced to be competitive with landline services available in cities. QUALCOMM believes that HDR is likely to be priced at a flat monthly fee that, even in urban areas, would be price-competitive with current, lower speed landline services. In addition, HDR will be capable of working with cell phones, personal computers, lap tops, Personal Digital Assistants (PDAs) and other types of commonly available customer equipment.

Most importantly for purposes of this proceeding, QUALCOMM's HDR technology is designed to work in conjunction with wireless voice services. By devoting one 1.25 MHz channel to HDR, a wireless carrier can add broadband data to its voice services. Thus, greater promotion of basic wireless voice services to Tribal Lands by the Commission will have the added benefit of supporting greater broadband Internet access as well. HDR transmitters could be mounted on the same towers as used by a wireless service provider serving a Tribal area, thus greatly expanding the range of services



available to its residents. This will minimize the need for operators to purchase additional equipment in order to gain broadband Internet access.

### **III. Policy Proposals**

Given the potential benefits of wireless technology, QUALCOMM urges the Commission to take the broadest possible approach with respect to the availability of Universal Service funding to support deployment of such technology in Tribal Lands and other remote areas. To this end, QUALCOMM believes that wireless operators should be able to qualify as eligible telecommunications carriers for purposes of universal service support and that their provision of advanced services to Tribal Lands should be recognized as eligible services. Such support makes eminent sense in light of the goals of Section 254 of the Act, including the goal stated therein that “consumers in all regions of the Nation, including low-income consumers and those in rural, insular or high-cost areas, should have access to telecommunications and information services, including interexchange services and advanced telecommunications and information services, that are reasonably comparable to those services provided in urban areas and at rates that are reasonably comparable to rates charged for similar services in urban areas.”<sup>20</sup>

For these reasons, QUALCOMM urges the Commission to extend eligibility for universal service support to wireless service providers offering advanced services, thus making HDR and other innovative service options available to Tribal Lands and other remote areas. As Section 254 plainly anticipates, telecommunications technology will continue to develop in ways that are not necessarily foreseeable now. The Commission

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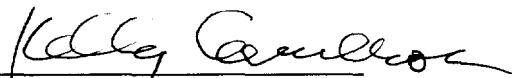
<sup>20</sup> 47 USC§254(b)(3).

must be willing to embrace these new developments and to alter its regulatory schemes in order to provide all Americans fair and reasonable access to advanced services.

Finally, QUALCOMM urges the Commission not to treat the ongoing proceeding in isolation, but rather as part of an overall effort to deploy new and innovative technology to Tribal Lands and other remote areas in partnership with carriers and manufacturers. QUALCOMM intends to keep the Commission informed of its own progress in developing and deploying HDR pilot programs and encourages the Commission to recognize the merits of such technology as part of its ongoing evaluation of universal service implementation policy.

Respectfully submitted,

**QUALCOMM INCORPORATED**

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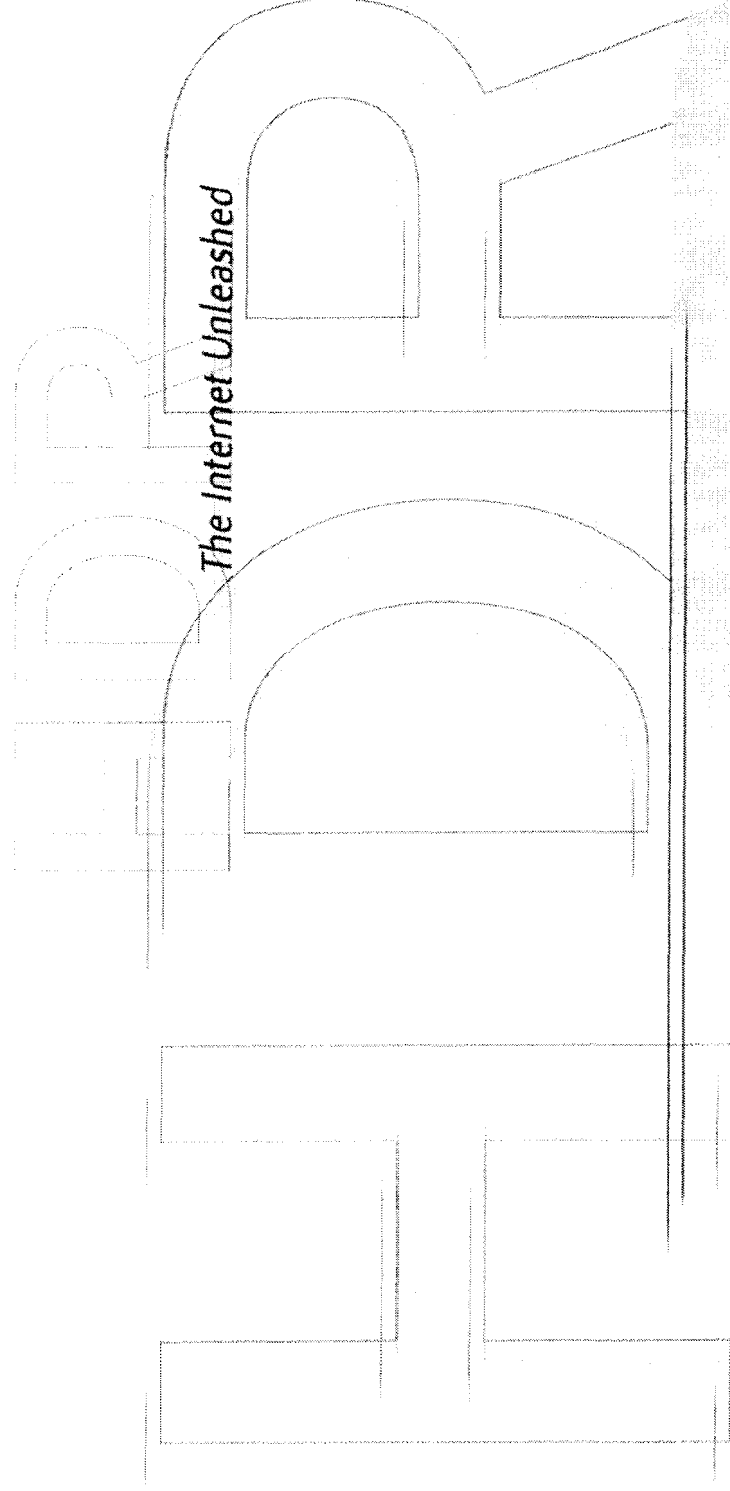
December 17, 1999

COMMENTS OF QUALCOMM INCORPORATED  
CC DOCKET No. 96-45  
DECEMBER 17, 1999

**ATTACHMENT 1**



# High Data Rate (HDR) Overview



## What is HDR?

HDR is a *high performance and cost-effective* Internet solution for consumers and businesses:

High speed/high capacity wireless Internet service

Built on mainstream IP backbones

Compatible with existing & future voice networks

Ideal for portable, mobile, and fixed applications



Portable



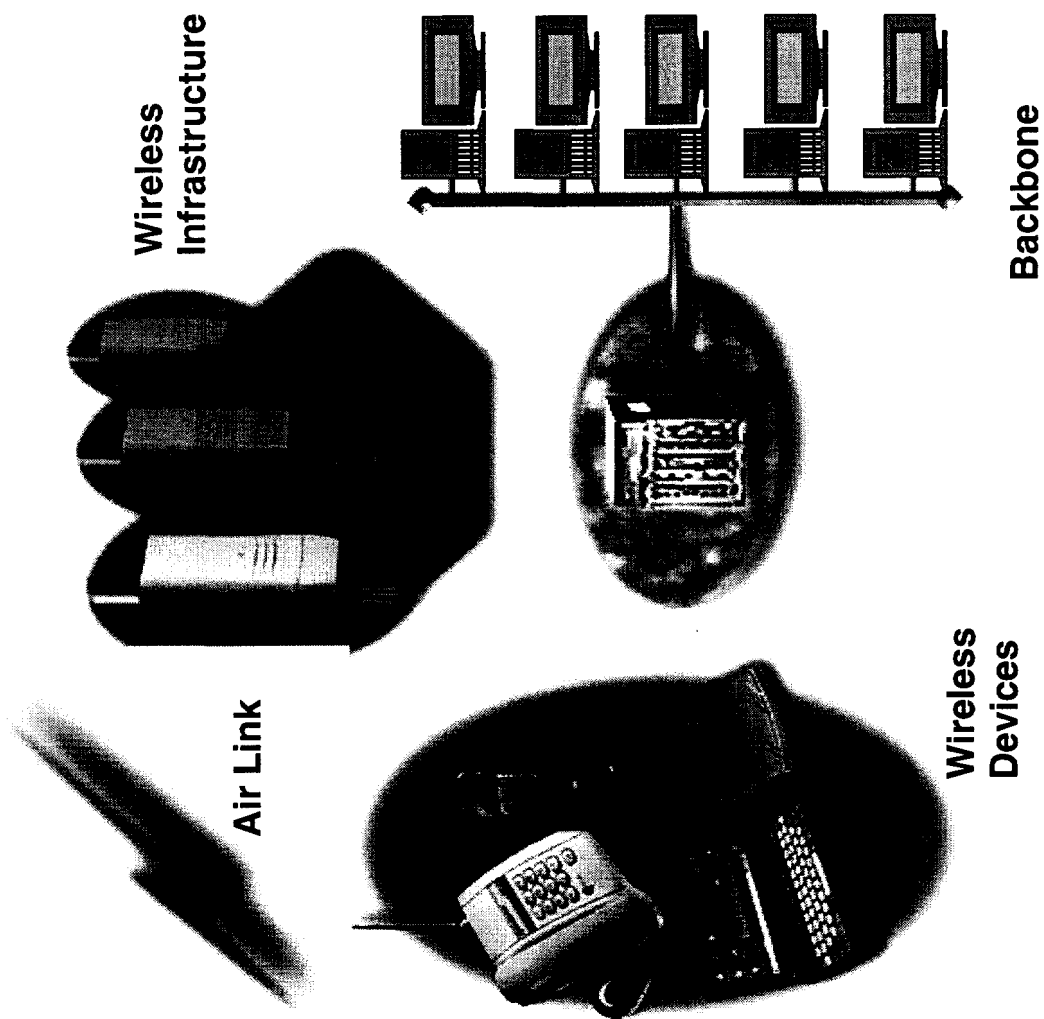
Mobile



Fixed

**QUALCOMM®**

## The HDR Solution



## **HDR Air Link**

***Spectrally efficient CDMA technology optimized for packet data services***

**Excellent throughput (bits/sec/Hz) per sector**

**2.4 Mbps forward peak sector throughput with a *single* CDMA 1.25 MHz frequency carrier**

**Asymmetric forward and reverse links**

**Forward link: 2.0 Mbps/cell average throughput (3 sector)**

**3.6 Mbps/cell (dual receive antennas)**

**Reverse link: 660 kbps/cell average throughput (3 sector)**

**Identical RF characteristics as IS-95/1X**

**Same chip rate, link budget, and coverage area**

**HDR carrier looks like an IS-95/1X carrier to the rest of the network**

## **HDR Wireless Devices**

**HDR enables a variety of wireless devices**

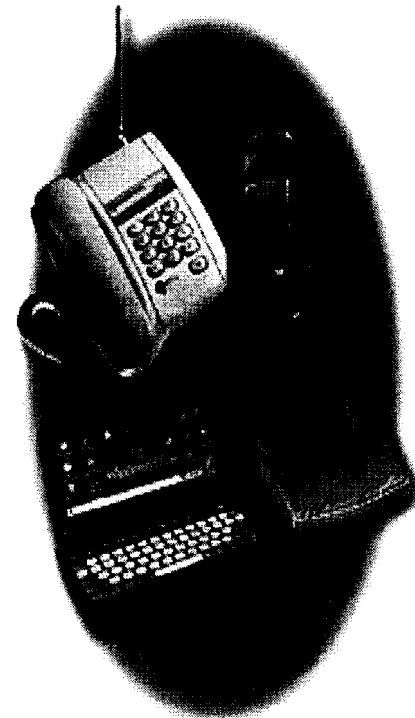
**Portable/mobile/fixed devices**

**High volume off-the-shelf devices**

**No installation required at  
customer site**

**IS-95/1X RF Compatibility**

**Dual-mode voice/  
data devices**





## **HDR**

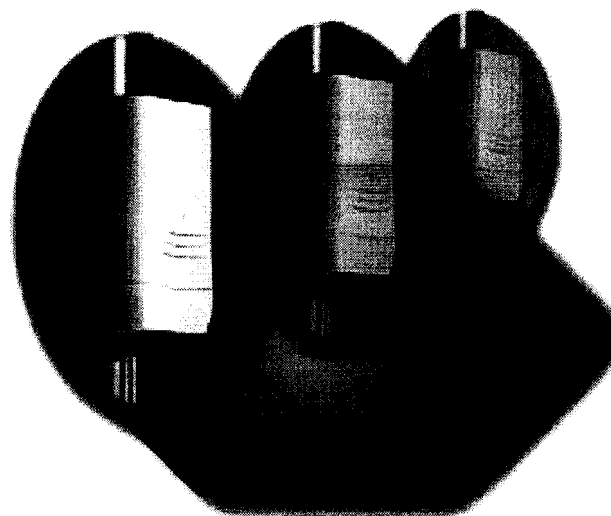
### **Wireless Infrastructure**

**Flexible architecture supports a variety of  
deployment scenarios**

**System upgrades with minimal equipment costs**

**Leverage from existing cell sites and networks**

**Easy to deploy in CDMA footprints**

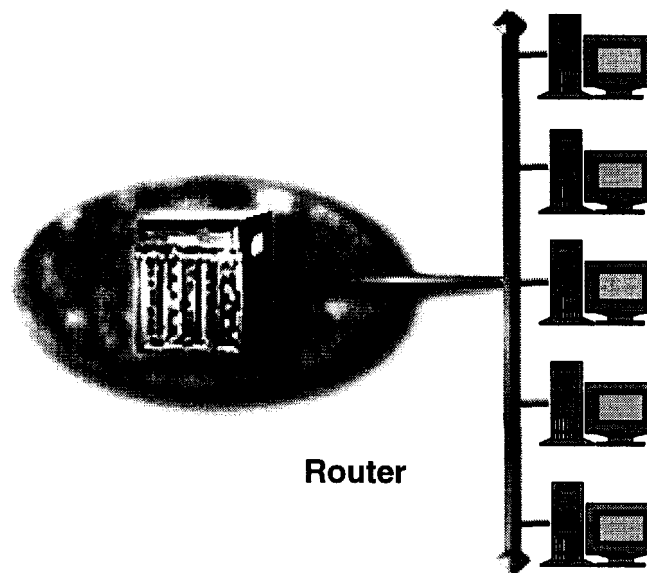


## **HDR Backbone**

**No changes required to IP network elements**

**Off-the-shelf hardware and software**

**Synergistic with the Internet industry  
and its evolution**



## **HDR**

### **Versatile Implementation**

## **Flexible architecture**

### **Stand-alone system**

**For data only network provider (ISP)**

**New wireless operator**

### **Shared system**

**For existing voice provider**

**Complement voice services**

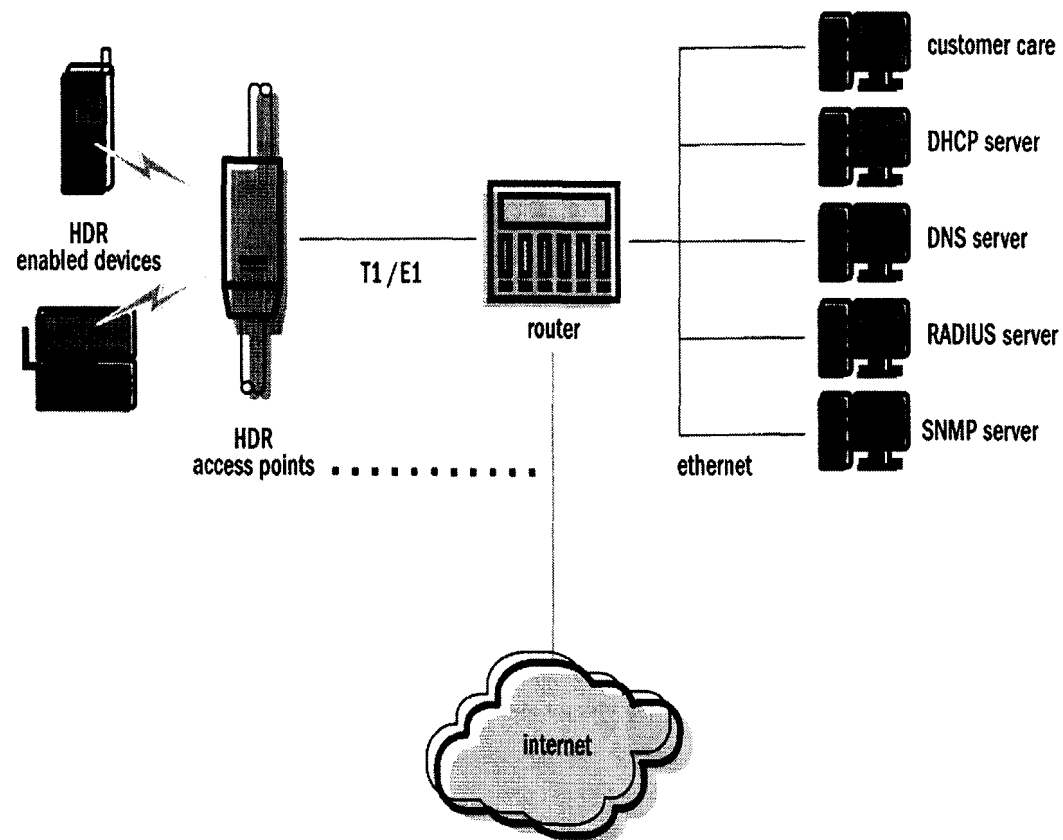
### **Integrated system**

**For existing IS-95 provider**

**For next generation voice provider**

## HDR Architecture

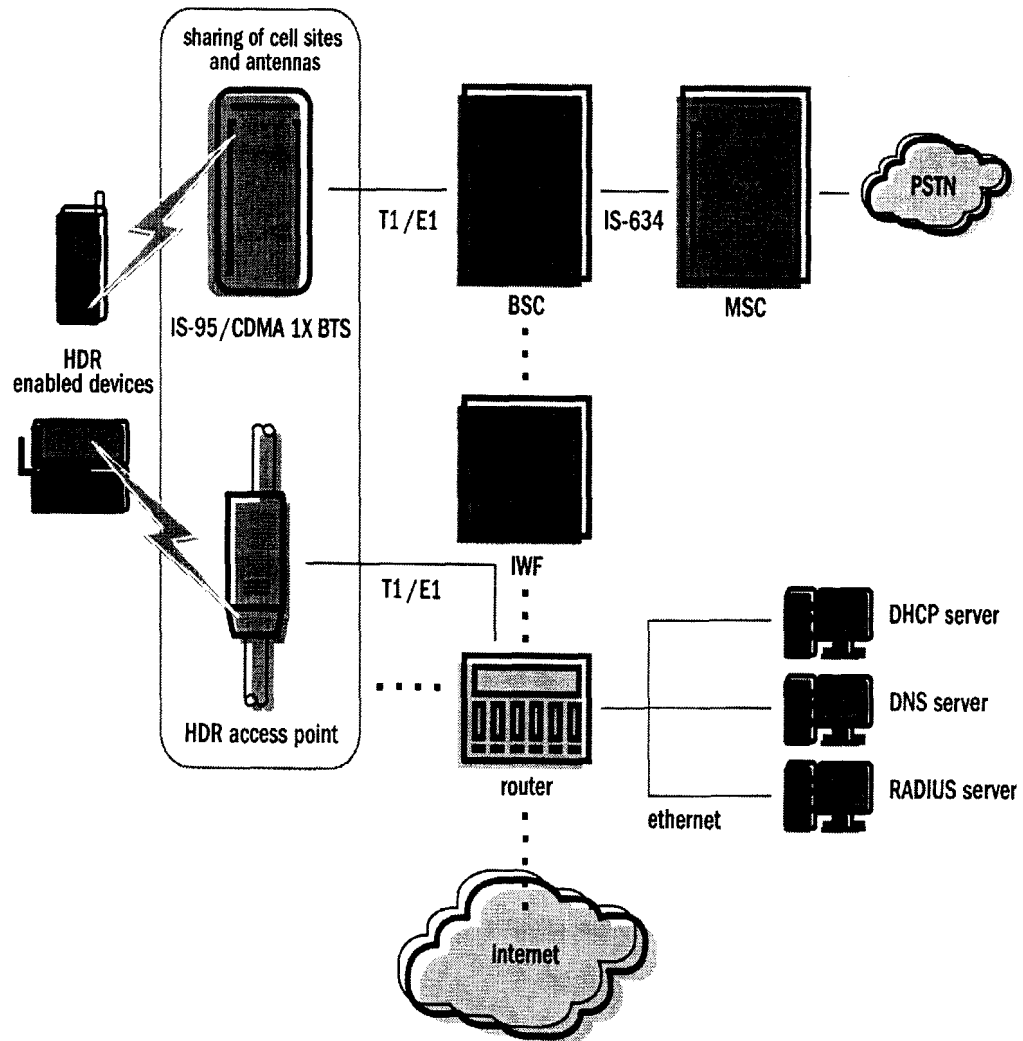
### Stand Alone System



# HDR Architecture

## Shared System

### HDR & Voice Complementary Services

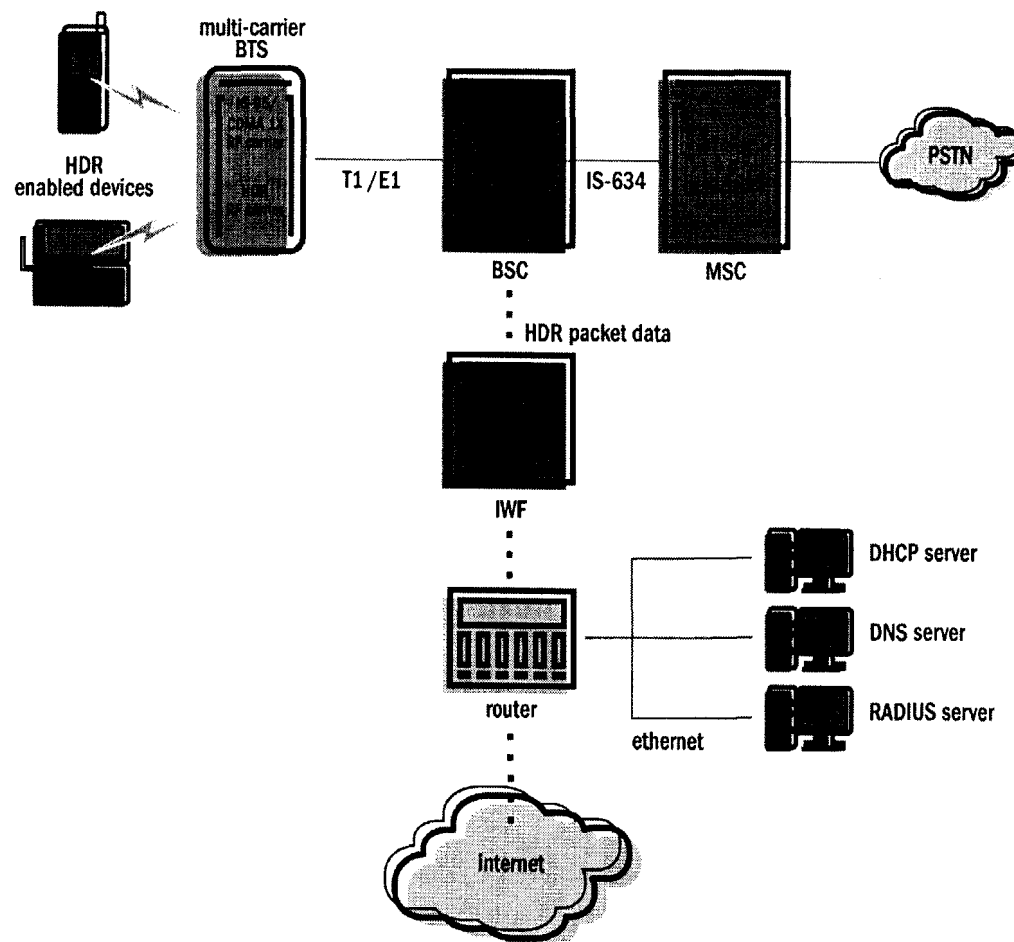




## HDR Architecture

### Integrated System

## HDR & IS-95/1X Complementary Services



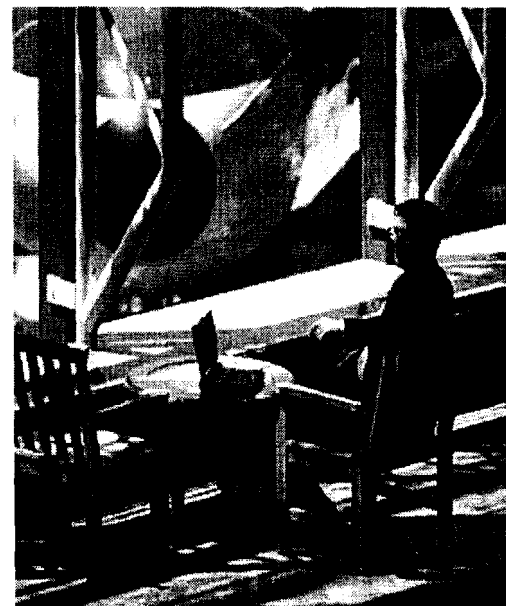
## **HDR Benefits:**

**Wireless  
Operator**

***Lower cost and higher performance data services than competing technologies***

**Rapid deployment with existing voice networks**

**Allows grow-as-you-go deployment strategy**



## **HDR Benefits:**

### **Consumer**

**HDR delivers significant benefits to consumers**

**Un-tethered access**

**“Always on”**

**High speed**

**Reliable and secure**







## **HDR Solution**

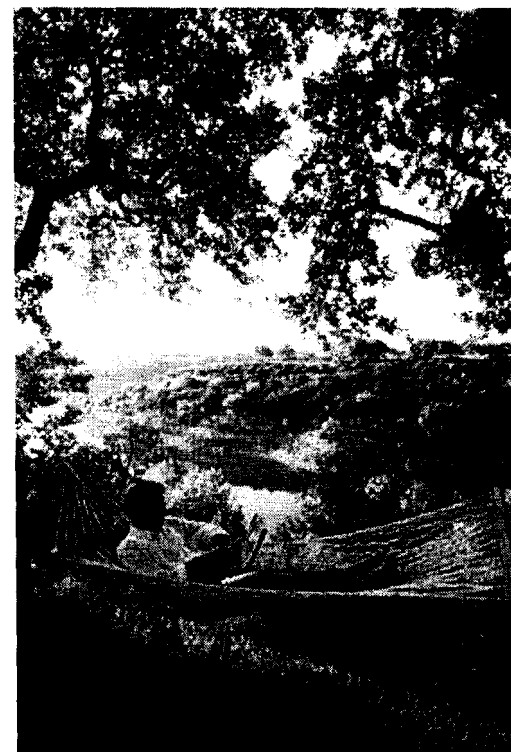
**Ideal for Wireless  
Internet Access**

**Unprecedented speed, capacity ... and mobility**

**IP-based network, optimized for packet data**

**Complementary to existing  
and future voice networks**

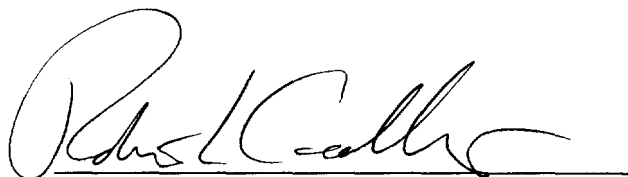
**Next generation  
performance, today**



HDR is the *enabling technology* for the wireless Internet market

**CERTIFICATE OF SERVICE**

I, Robert L. Galbreath, hereby certify that copies of the attached document were served on December 17, 1999 in the manner indicated on the following parties:

A handwritten signature in black ink, appearing to read "Robert L. Galbreath", written over a horizontal line.

Robert L. Galbreath, Esquire

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